Draft OU-4 Interim Remedy Feasibility Study Appendix D, Adaptive Management
dated Sept. 25, 2019
NJDEP Comments, Nov. 1, 2019

Review of Appendix D of the draft FS for the Interim Remedy of the Upper 9 Miles of the lower Passaic River (DASS-OU-4) has been completed. The Department had previously reviewed the CPG's July 24, 2019 draft Adaptive Management proposal and supplied comments dated August 13, 2019. Through this current review, it was found that the Department's prior comments still apply. FS Appendix D was built upon the CPG's July 24, 2019 presentation, without apparent modifications in response to either EPA or DEP verbal and written comments. Since prior comments still apply, rather than re-iterating them, major points organized as "Introduction/Context" and "Comments" are provided below. It is recommended that Department comments dated August 13, 2019, and the comments provided below, are incorporated into the next version of FS Appendix D.

Introduction/Context: At its core, Adaptive Management (AM) is used at complex sediment remediation sites for incorporating appropriate adjustments during each phase of the remedial process to promote improved progress to successful remediation. It is intended to be a forward-planning mechanism for reducing project uncertainties while allowing remedial actions to proceed. Rather than following rigid protocol, adaptive management is a means to address project uncertainties during the various project phases (i.e., investigation, design, implementation, and long-term monitoring) and allows for appropriate adjustments to be made to reduce phase-specific uncertainty. However, AM is also structured, in that, it is driven by the testing of site-specific hypotheses and guided by resulting conclusions, and allows for re-evaluation of site assumptions, if warranted, as new information is gathered (USEPA 2005). As EPA has indicated, and NJDEP supports, the overall goal is to "… *incrementally reduce site uncertainties while supporting continued site progress."* (USEPA 2018)

CPG's draft AM program is organized based on 3 Elements: Development of PRGS/RGs; Overall System Response; Recovery Assessment to attain PRGs/RGs

Response: As discussed previously, AM can be viewed at both the overall project level and at each specific project phase. The CPG has provided an AM plan using an overall project level approach, but DEP believes there is value in analyzing AM opportunities within each phase. A section is requested focusing on AM uncertainties leading to ROD 1and each phase thereafter; an organizational structure is offered below:

IR ROD 1 Remedial Design – Within this phase, identify the key uncertainties which may limit success of the design work to engineer the key elements of IR Implementation. This involves testing existing hypotheses and re-evaluating site assumptions used during the FS stage that led to ROD 1. At this point, AM is utilized to promote ROD 1 success in attaining RAOs. In addition, the necessary information for PRG development are collected so PRGs are generated during this phase.

IR ROD 1 Remedial Implementation – Similarly, identify the key uncertainties and features of IR construction that may limit the success of the IR in attaining RAOs. Again, this involves testing existing hypotheses and re-evaluating site assumptions used during design that led to size/shape/processes used for construction.

Post-ROD 1 Recovery Monitoring to achieve RGs – The focus at this stage is for obtaining data most representative of the recovery process. Adjustments/improvements in monitoring locations and methods may occur via adaptive management, provided these still allow for long-term trend analyses. In addition, if recovery is progressing slower than anticipated, diagnostic assessments and supplemental data collection may occur.

Specific Comments:

1. Section 3.1, Element 1: The development of PRGs is considered a separate and parallel effort to ROD 1 Design and Implementation. However, existing uncertainties hindering development of PRGs could be identified and addressed within the Remedial Design phase. This will involve identification of specific hypotheses and/or assumptions to be tested. However, the Department disagrees with two aspects of CPG's current proposal:

a. that a range of PRGs would be developed and periodically refined, and

b. that this "refinement" could occur over the course of an extended timeline (2 decades). This type of approach to PRG/RG development prevents the use of these e important goal posts from *effectively guiding* AM for this project once ROD 1 is implemented. As with all Remedial Projects (Federal or State), PRGs need to be developed as soon as feasible. Once established, PRGs and the subsequently-selected RGs, comprise the key metrics by which remedial success is judged. Unless new and significantly different information comes to light, PRGs are not expected to undergo revision once established.

It appears footnote 2 on page 2-1, taken from EPA guidance, is being cited potentially outside of its original context, in to support developing a range of working PRGs that are re-evaluated and refined over an extended period of time (of ~20 years). Instead, the cited EPA guidance was likely meant to identify the shorter-term process of PRG development and subsequent RG selection *contained within the latter stages of risk assessment and within the FS,* which is generally performed within a relatively short time frame (~ 1-2 years), typically comprising the time between a Proposed Plan (PRGs) and ROD (RGs). CERCLA remedial actions are shaped by alternatives *developed to meet final, site-specific RGs*, which, necessarily, are identified ***early*** in the decision-making process, not at the end, as indicated in the CPG's proposal.

2. Section 3.2, page 3-3: With regard to PRG development, text states: "Key input parameters and data uncertainties for PRG development are identified in Table 3-2. Some of these variables have substantial uncertainties that may be reduced through additional data to be collected during the ongoing current conditions sampling program and post-IR LTM." **Response**:

a. Table 3-2 discusses opportunities to better characterize complex relationships, refine the FWM, and better characterize calibrated processes. If it is intended that Adaptive Element 1 includes focused data collection to support refinement and recalibration of the FWM, this should

be stated in Section 3.2, and these activities should be accounted for in the time line and decision tree.

b. Please supplement text and Table 3-2 to identify which data in support of PRG development are collected during the current conditions sampling and which would be collected during post-IR LTM.

c. PRGs should be developed and available prior to the post-IR time period for this project. What prevents this from occurring? The Department currently does not support delaying collection of data in support of the FWM data until the post-IR LTM phase.

3. Section 3.2, page 3-3, first full paragraph: Text describes the benefits of LTM data. However, LTM primarily serves the function of evaluating system recovery following ROD 1 completion. It is not viewed as a critical path for PRG development, which presumable should have been developed before this time. Clarification is needed on the specific parameters that are currently uncertain and prohibit or hinder PRG development in the near term (similar to Comment 2 a-c above).

4. Section 3.2, page 3-3, last full paragraph: This entire discussion on the reasons why surface water quality standards (ARARs) cannot be attained is considered premature and should be removed. In addition, the discussion is considered unsupported because it does not describe contaminant load versus particulate load, which matters for key COCs for this river.

5. Section 3.3, page 3-4: Since "ranges of working PRGs" are not acceptable to USEPA and NJDEP, this section requires revision per discussion during the Oct. 24, 2019 FS Work Group meeting (# 22).

6. Table 3-2, Key LPRSA Uncertainties in PRG Development: This table should be re-structured to identify the specific data not yet available for PRG development and list the hypotheses to be tested. The OU-4 RI and risk assessments have already identified the current exposure point concentrations, receptors, exposure pathways of concern, and site-relevant toxicity information. The existing site-specific information is expected to be used for PRG development. Refinement of BASFs and BAFs may be warranted and can be addressed through data collection of appropriate sediment, surface water and biota tissues samples aimed at focused and improved understanding of these relationships in this river.

- Remove "sediment exposure depth" – this topic has already been resolved for this project. Please refer to Agency comments on this topic provided during review of the RI and risk assessments.
- Discussion/ Consensus is needed for the data to be collected in support of the FWM; once identified, this information should be collected as soon as feasible during RD.

7. Table 3-1: Benthic invertebrates? This ecological receptor group is missing.

8. Figures 2-4, 3-1, 3-2: These figures require revision to:

a. remove “range of PRGs” and
b. remove depiction of the PRG development/refinement process extending beyond ROD 1 Remedial Design (and to past 2041).
c. In addition, it is recommended that Figure 3-1 is amended to place anticipated timeframes in the left column, under Project Element.

PRGs and final RGs are to be developed as soon as feasible; the information needed to do so must be prioritized for collection early in the overall timeline and completed early in RD phase.

9. Section 4.2 “Uncertainties and Data Needs for Adaptive Element 2”:

Section 2.6 of the Interim Remedy FS presents the Source Control CSM, as noted in Section 2.4 of Appendix D. The CSM includes a number of testable hypotheses including the following:

• Natural recovery of surface sediment COC concentrations occurs principally as a result of lower concentration depositing particles burying surface sediment or diluting surface sediment via cyclical erosion and deposition.

• The rate of recovery is likely controlled by net erosion of higher concentration sediment and cyclical erosion and deposition that bring higher subsurface concentrations into the surface layer.

• Sediment is a net source to the water column where sediment concentrations are greater than those found on particles depositing from the water column.

Section 4 states its hypothesis for Adaptive Element 2 in more general terms: “Is the system response the source control IR consistent with the CSM and numerical models?” It proposes to use LTM data to evaluate the numerical model as the embodiment of the CSM. Biota, water column, and sediment chemistry would be collected annually, sediment chemistry approximately every five years, and bathymetry periodically, i.e. following a high-flow event. These data would be used to compare recovery to model projections. Diagnostic data collection would be triggered after a series of five-year review cycles, if the system is responding more slowly than indicated by the range of model projections. Figure 4-1 shows the reevaluation of the CSM commencing in 2041.

The CSM rests on specific hypotheses about the existence of depositional and erosional areas of sediment, and movement of contaminants from erosional to depositional areas on particles delivered via the water column pathway. ***Uncertainties pertaining to these specific hypotheses are the most critical hypotheses to the reliability of the CSM. It is unclear how the LTM data collection that is proposed could support testing of these specific hypotheses or reduce the uncertainty surrounding them.*** It appears that the LTM will be focused solely on developing data trends to compare to numerical model trends. It also appears that the Adaptive Management Plan begins collecting diagnostic data for Adaptive Element 2 at a very late stage. Data to relate trends to underlying processes take years to collect, so Figure 4-1 is overly optimistic to envision data collection and CSM evaluation to be completed in 2 years (2043). To facilitate a more timely and effective diagnosis and adaptation, if ultimately needed, the Adaptive Management

Plan should be more explicit about the hypotheses that make up the source control CSM, providing a road map for the most informative water column, sediment, and bathymetric data to collect as part of LTM to test those specific hypotheses, if and when a diagnosis is needed.

10. Section 5.2 "Uncertainties and Data Needs for Adaptive Element 3"
Section 5 also states the Element 3 hypothesis in general terms: "Is recovery progressing in media of concern to reach protective levels within a reasonable time frame?" As with Element 2, LTM data would be used to test this general hypothesis and diagnostic data collection and assessment would not commence until trend evaluation based on LTM data is complete, shown as 2041 in Figure 5-1b. As noted for Element 2, the Adaptive Management Plan calls for diagnostic data collection to begin at a very late stage, and new data to relate trends to underlying processes collected after 2041 would take many years to collect. Adaptive Elements 2 and 3 are closely related, and earlier data collection to support testing of the hypotheses that comprise the CSM, as part of Adaptive Element 2, would also facilitate an earlier and more effective diagnosis of recovery trends if and when needed to compare to specific targets for Adaptive Element 3. In addition, more explicit statements of hypotheses for Adaptive Element 3 would support more effective testing, by helping to guide LTM planning. For example, the first numbered factor listed on page 5-3 is a hypothesis, presumably informed by the CSM, of a causal factor that could inhibit recovery: "recovery is not expected to be monotonic over time due to interannual variability and episodic high flow events…". This hypothesis could be taken into account in planning the frequency and timing of LTM events. It is envisioned in Section 5.3 that the diagnostic assessment would at some future time identify causal factors that could inhibit recovery. ***Early identification of those factors, supported by hypotheses, and early data collection, as part of LTM, to support testing of those hypotheses, would support more timely adaptive management, should recovery fall short of goals.***

11. Figure 4-2, System Response: The first key question posed states: "Is system response to IR consistent with numerical models?" Clarification needed: does this assume ROD 1 RAOs have been successfully achieved? It may be more appropriate to have the first question address ROD 1 completion, and if that has been met, then recovery rates are evaluated. Otherwise, add a footnote stating status of project relative to ROD 1 RAOs for this process to be relevant.

12. Figure 5-2, Recovery Assessment: How can assessment of "recovery" be determined without knowing RGs in the beginning of this process? Such an assessment is considered weak, if only performed in relation to model predictions and not yet informed by final RGs.

References:

USEPA 2005, *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, EPA-540-R-05-012 Office of Solid Waste and Emergency Response OSWER 9355.0-85 December 2005, https://semspub.epa.gov/work/HQ/174471.pdf

USEPA 2018, *Superfund Task Force Recommendation #3: Broaden the Use of Adaptive Management*, From James E. Woolford, Director, Office of Superfund Remediation and Technology Innovation to Superfund National Program Managers, Regions 1-10, https://semspub.epa.gov/work/HQ/100001630.pdf